Catalyst Measurement

version 2014-09-23

Color Coding Legend				
Data Entry Cell	Calculated Cell	Acceptable Percent Difference Calculation	Potential Compliance Issue, Percent Difference Calculation	Instrument Calibration Out of Range

Daily Calibration Results

			End Rod Result	Accuracy (mm)
Instrument Used	Starrett calipers (SN: 04231713)	25 mm End Rod	24.99	0.015
Date of Last Simco Calibration	5/6/2015	50 mm End Rod	49.99	0.01
		75 mm End Rod	74.98	0.02

Engine Family	FYMGS.6592DI
VIN/Serial No.	S210P-2112815
Task Directive	TD2, Opt. 2
Entry Number	600-6430848-3
Inspection Number	20150528-1030-01
Catalyst Inspection Date	5/28/2015
Certificate Catalyst Manufacturer	Not specified
Certificate Catalyst Part Number	17140-97505-000
Observed Catalyst Markings	None

	1st Measured Value (mm)	2nd Measured Value (mm)	3rd Measured Value (mm)	4th Measured Value (mm)	Calculated Average Value (mm)	Percent Difference	Certificate Values
Diameter: outside of exhaust piping	95.60	95.14	94.97	95.18	95.22		
Diameter: outside of catalyst casing	Not measured	Not measured	Not measured	Not measured	--		
Diameter: inside of catalyst casing (catalyst diameter)	83.95	84.44	84.30	84.31	84.25		
Length: exhaust piping	112.38	112.40	112.46	112.45	112.42		
Length: catalyst casing	Not measured	Not measured	Not measured	Not measured	--		
Length: catalyst material	Not measured directly	Not measured directly	Not measured directly	Not measured directly	104.19		
Inset: catalyst casing (side 1)	Not measured	Not measured	Not measured	Not measured	--		
Inset: catalyst casing (side 2)	Not measured	Not measured	Not measured	Not measured	--		
Inset: catalyst substrate (side 1)	0.00	0.00	0.00	0.00	0.00		
Inset: catalyst substrate (side 2)	8.21	8.09	8.38	8.24	8.23		

Counted cells (total)	5284	volume cc	580.85
Avg inside diameter of casing (in)	3.32	cells/in^2	611.51
PAIR Observed? (Y/N)	N	Certified with PAIR (Y/N)?	
PAIR Photo Name	--		

Estimated Surface Area of Honeycomb Catalyst

Units	Calc from Measured Values	Calc from Cert Values	Percent Difference
sq. mm	2,319,906		
sq. in	3595.9		

	Calc from Measured Values	Calc from Cert Values
Honeycomb Face (sq. mm)	5575	
Area of One Cell (sq. mm)	1.06	
Radius of Semi-Circle	0.82	
cells/mm^2		

Counting Comments	The number of cells was determined using the following equation (see photo DSCN0784 - Cell count.jpg for reference): Total cells = (# of cells in Box 1) + (# of cells in Box 2) + (# of cells in Box 3) + (# of cells in Box 4) + (# of cells in Box 5) + (# of cells outide of boxes) The number of cells in each box (Boxes 1 through 5) was determined by counting the number of cells along its length and width, then multiplying the two numbers. Number of cells in Box 1: 6 cells by 30 cells = 180 cells Number of cells in Box 2: 10 cells by 41 cells = 410 cells Number of cells in Box 3: 6 cells by 29 cells = 174 cells Number of cells in Box 4: 11 cells by 37 cells = 407 cells Number of cells in Box 5: 50 cells by 64 cells = 3,200 cells The cells outside the boxes were counted directly (913 cells were counted) Total cells = 180 + 410 + 174 + 407 + 3,200 + 913 cells = 5,284 cells
Inspection Comments	Catalyst dimensions were not included in the certification application. Manufacturer sent an email on 5/28/2015 indicating substrate dimensions of The measured catalyst material diameter the certified value. The calculated cell density the certified value.
Photo Used for Counts	DSCN0784 - Cell count.jpg

Inspector:	Dilan Bellinghoven
Report Date:	5/29/2015

Catalyst Precious Metals Analysis

version 2015-03-19

Engine Family	FYMGS.6592DI
VIN/Serial No.	S210P-2112815
Task Directive	TD2, Opt. 2
Entry Number	600-6430848-3
Inspection Number	20150528-1030-02
Catalyst Inspection Date	5/28/2015
Certificate Catalyst Manufacturer	Not specified
Certificate Catalyst Part Number	17140-97505-000
Observed Catalyst Markings	None
Catalyst Type (Honeycomb or mesh):	Honeycomb

Instrument Used	X-5000 (S/N: 202212)
Calibration Curve Name	Ceramic Curve 2015-01-16
Check Standard	NIST 2557

Daily Calibration Results (Pre-Inspection)

	Measured Value (ppm)	Certified Value (ppm)	Percent Difference	Comments
Pt	1,178	1,131	4.2%	
Pd	243	233	4.2%	
Rh	148	135	9.5%	

Daily Calibration Results (Post Inspection)

	Measured Value (ppm)	Certified Value (ppm)	Percent Difference	Comments
Pt	1,178	1,131	4.2%	
Pd	245	233	5.1%	
Rh	147	135	8.8%	

Measured Metal Ratios

	Measured Value (% concentration, by weight)	Measured Value (ppm)	Calculated Ratio from Measurement
Pt	0.093	929	4.1
Pd	0.023	232	1.0
Rh	0.023	228	1.0
Ce	24.870	248,700	[redacted]
Zr	6.063	60,628	

Certified Metal Ratios

	Reported Cert Loading Value	Reported Cert Loading Value Units	Calculated Loading Value (g/L)	Calculated Cert Ratio	Reported Cert Ratio
Pt	[redacted]				
Pd					
Rh					
Total					

Value to compare against measured: Reported Cert Ratio

Ratio Percent Difference (%)

Pt	NA
Pd	NA
Rh	NA

Loading Determination

Sample Extraction Method	Drilled holes
Weight of Extracted Powder (g)	4.34

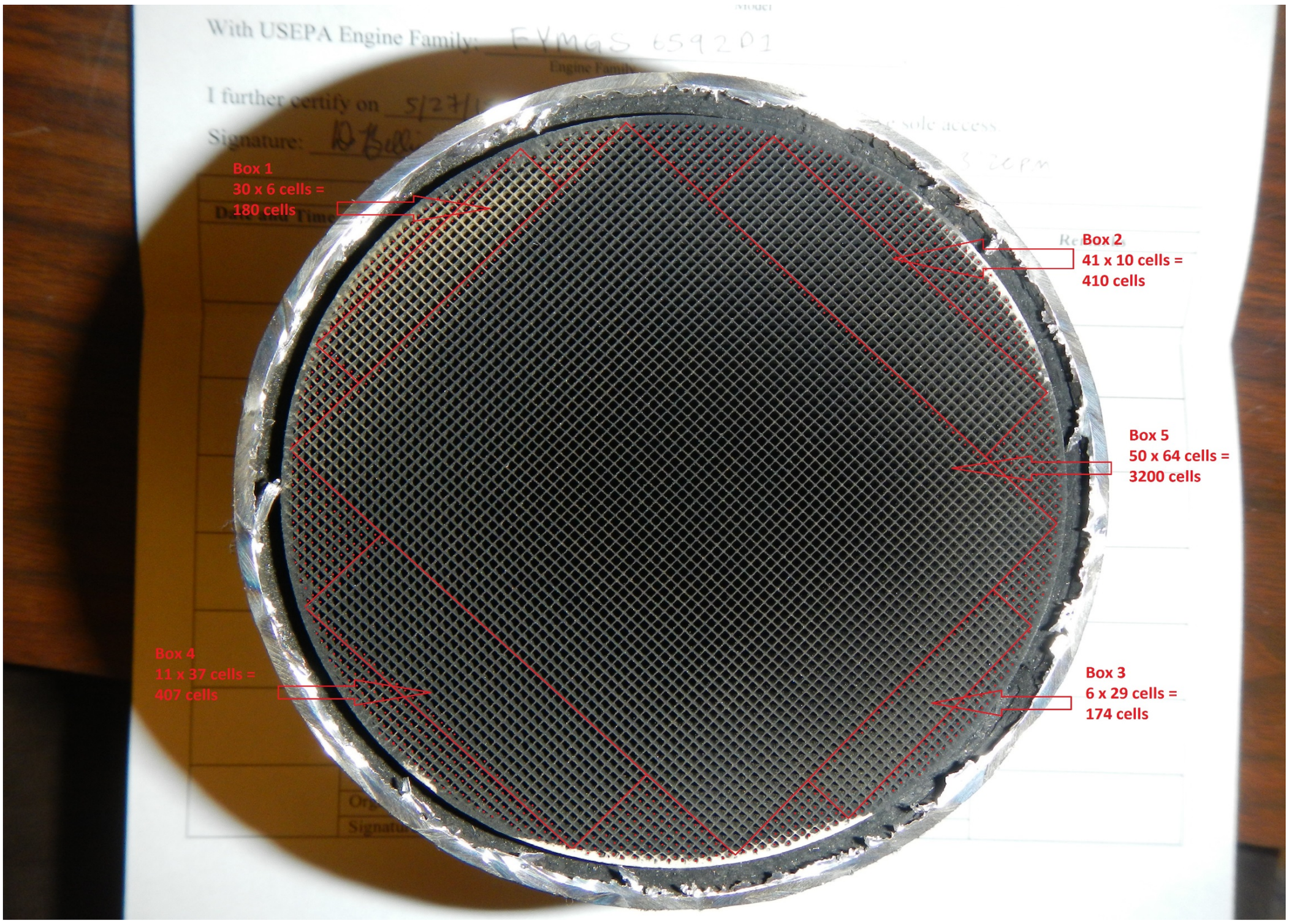
Manually Extracted Volume (for loadings)

Hole #	Drill Bit Diameter (inches)	Hole Length/Depth (mm)	Hole Volume (mm^3)	Hole Volume (L)
Hole 1	23/64	104.19	6,819	0.006819
			Total Volume of Extraction Holes:	0.006819

Loading

	Extracted Washcoat Powder Weight (g)	Calculated Metals Loading (g/L)	Cert Value - Loading (g/L)	Loadings Percent Difference (%)
Pt	0.00403	0.591	[redacted]	
Pd	0.00101	0.148		
Rh	0.00099	0.145		
Total	0.00603	0.88410		

Test Conditions	3 runs, 90 seconds each
Check Standards	The measured concentrations of all precious metals tested were within 10% of their certificate values for the check standard.
Result Comments	This catalyst is certified to contain [redacted] both were detected in this catalyst. The calculated loading for palladium was [redacted] the certificate value. This is likely due to an error in the certification documents which reports [redacted], it is likely that the reported unit (g/L) is incorrect, and should be [redacted] Assuming a certified loading of [redacted] the calculated loading of this catalyst is [redacted] the certificate value.
Related Photo(s)	DSCN0782 - DSCN0784
Inspector(s):	Dilan Bellinghoven
Report Date:	5/29/2015


With USEPA Engine Family: 6VMGS 659201
I further certify on 5/27/
Signature:
Box 1
30 x 6 cells =
180 cells
Box 2
41 x 10 cells =
410 cells
Box 5
50 x 64 cells =
3200 cells
Box 4
11 x 37 cells =
407 cells
Box 3
6 x 29 cells =
174 cells